

**CLAIMS**

1. An X-ray tube control apparatus which remotely controls an X-ray tube, comprising:

first storage means which stores a plurality of warming-up programs for respectively increasing a tube voltage and a tube current of said X-ray tube to a maximum tube voltage value and a maximum tube current value corresponding thereto according to a process corresponding to a downtime during which said X-ray tube has not operated when said X-ray tube starts operating, according to the maximum tube voltage values;

first extraction means which extracts one from said plurality of warming-up programs stored in said first storage means which corresponds to the maximum tube voltage value after being changed at that time the maximum tube voltage value of said X-ray tube is changed; and

first rewriting means which rewrites a warming-up program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said warming-up program extracted by said first extraction means via a telecommunications line.

2. An X-ray tube control apparatus which remotely controls an X-ray tube, comprising:

second storage means which stores a plurality of

limit tube voltage control programs for stopping application of a tube voltage with a limit tube voltage value corresponding to a maximum tube voltage value of said X-ray tube as a threshold, according to the maximum tube voltage values;

second extraction means which extracts said limit tube voltage control program from said plurality of limit tube voltage control programs stored in said second storage means which sets a limit tube voltage value corresponding to the maximum tube voltage value after being changed as a threshold at that time the maximum tube voltage value of said X-ray tube is changed; and

second rewriting means which rewrites a limit tube voltage control program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said limit tube voltage control program extracted by said second extraction means via a telecommunications line.

3. An X-ray tube control apparatus which remotely controls an X-ray tube, comprising:

third storage means which stores a plurality of limit tube current control programs for stopping application of a tube voltage with a limit tube current value corresponding to a maximum tube voltage value of said X-ray tube as a threshold, according to the

maximum tube voltage values;

third extraction means which extracts said limit tube current control program from said plurality of limit tube current control programs stored in said third storage means which sets a limit tube current value corresponding to the maximum tube voltage value after being changed as a threshold at that time the maximum tube voltage value of said X-ray tube is changed; and

third rewriting means which rewrites a limit tube current control program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said limit tube current control program extracted by said third extraction means via a telecommunications line.

4. An X-ray tube control apparatus which remotely controls an X-ray tube, comprising:

fourth storage means which stores a plurality of focus lens control programs for controlling a focus lens in such a way as to minimize a focal point when an electron beam hits a target of said X-ray tube with a maximum tube voltage applied to the target, according to the maximum tube voltage values;

fourth extraction means which extracts said focus lens control program from said plurality of focus lens control programs stored in said fourth storage means

which corresponds to the maximum tube voltage value after being changed at that time the maximum tube voltage value of said X-ray tube is changed; and

fourth rewriting means which rewrites a focus lens control program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said focus lens control program extracted by said fourth extraction means via a telecommunications line.

5            5. An X-ray tube control method which remotely controls an X-ray tube with an X-ray tube control apparatus,

          wherein a plurality of warming-up programs for respectively increasing a tube voltage and a tube current value of said X-ray tube to a maximum tube voltage value and a maximum tube current value corresponding thereto according to a process corresponding to a downtime during which said X-ray tube has not operated when said X-ray tube starts operating are stored in first storage means of said X-ray tube control apparatus beforehand according to the maximum tube voltage values, and comprising:

          a first extraction step at which first extraction means of said X-ray tube control apparatus extracts one from said plurality of warming-up programs stored in said first storage means which corresponds to the

maximum tube voltage value after being changed at that time the maximum tube voltage value of said X-ray tube is changed; and

5 a first rewriting step at which first rewriting means of said X-ray tube control apparatus rewrites a warming-up program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said warming-up program extracted by said first extraction means via a telecommunications  
10 line.

6. An X-ray tube control method which remotely controls an X-ray tube with an X-ray tube control apparatus,

wherein a plurality of limit tube voltage control  
15 programs for stopping application of a tube voltage with a limit tube voltage value corresponding to a maximum tube voltage value of said X-ray tube as a threshold are stored in second storage means of said X-ray tube control apparatus beforehand according to the  
20 maximum tube voltage values, and comprising:

a second extraction step at which second  
extraction means of said X-ray tube control apparatus extracts said limit tube voltage control program from said plurality of limit tube voltage control programs  
25 stored in said second storage means which sets a limit tube voltage value corresponding to the maximum tube

voltage value after being changed as a threshold at that time the maximum tube voltage value of said X-ray tube is changed; and

5 a second rewriting step at which second rewriting means of said X-ray tube control apparatus rewrites a limit tube voltage control program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said limit tube voltage control program extracted by said second  
10 extraction means via a telecommunications line.

7. An X-ray tube control method which remotely controls an X-ray tube with an X-ray tube control apparatus,

15 wherein a plurality of limit tube current control programs for stopping application of a tube voltage with a limit tube current value corresponding to a maximum tube voltage value of said X-ray tube as a threshold are stored in third storage means of said X-ray tube control apparatus beforehand according to the  
20 maximum tube voltage values, and comprising:

25 a third extraction step at which third extraction means of said X-ray tube control apparatus extracts said limit tube current control program from said plurality of limit tube current control programs stored in said third storage means which sets a limit tube current value corresponding to the maximum tube voltage

value after being changed as a threshold at that time  
the maximum tube voltage value of said X-ray tube is  
changed; and

5 a third rewriting step at which third rewriting  
means of said X-ray tube control apparatus rewrites a  
limit tube current control program, stored in a memory  
section in a control apparatus that controls an  
operation of said X-ray tube, with said limit tube  
current control program extracted by said third  
10 extraction means via a telecommunications line.

8. An X-ray tube control method which remotely  
controls an X-ray tube with an X-ray tube control  
apparatus,

15 wherein a plurality of focus lens control  
programs for controlling a focus lens in such a way as  
to minimize a focal point when an electron beam hits a  
target of said X-ray tube with a maximum tube voltage  
applied to the target are stored in fourth storage  
means of said X-ray tube control apparatus according to  
20 the maximum tube voltage value beforehand, and  
comprising:

a fourth extraction step at which fourth  
extraction means of said X-ray tube control apparatus  
extracts said focus lens control program from said  
25 plurality of focus lens control programs stored in said  
fourth storage means which corresponds to the maximum

tube voltage value after being changed at that time the maximum tube voltage value of said X-ray tube is changed; and

5 a fourth rewriting step at which fourth rewriting means of said X-ray tube control apparatus rewrites a focus lens control program, stored in a memory section in a control apparatus that controls an operation of said X-ray tube, with said focus lens control program extracted by said fourth extraction means via a  
10 telecommunications line.

9. An X-ray tube control apparatus comprising:

input means to which a maximum tube voltage value of an X-ray tube is input;

15 storage means which stores a plurality of warming-up programs for respectively increasing a tube voltage and a tube current of said X-ray tube to a maximum tube voltage value and a maximum tube current value corresponding thereto according to a process corresponding to a downtime during which said X-ray  
20 tube has not operated when said X-ray tube starts operating, according to the maximum tube voltage values;

25 extraction means which extracts one from said plurality of warming-up programs stored in said storage means which corresponds to the maximum tube voltage value input to said input means; and



output means which outputs said warming-up program extracted by said extraction means.

10. An X-ray tube control apparatus comprising:

5 input means to which a maximum tube voltage value of an X-ray tube is input;

storage means which stores a plurality of limit tube voltage control programs for stopping application of a tube voltage with a limit tube voltage value corresponding to a maximum tube voltage value of said X-ray tube as a threshold, according to the maximum tube voltage values;

15 extraction means which extracts one from said plurality of limit tube voltage control programs stored in said storage means which corresponds to the maximum tube voltage value input to said input means; and

output means which outputs said limit tube voltage control program extracted by said extraction means.

11. An X-ray tube control apparatus comprising:

20 input means to which a maximum tube voltage value of an X-ray tube is input;

storage means which stores a plurality of limit tube current control programs for stopping application of a tube voltage with a limit tube current value corresponding to a maximum tube voltage value of said X-ray tube as a threshold, according to the maximum

tube voltage values;

extraction means which extracts one from said plurality of limit tube current control programs stored in said storage means which corresponds to the maximum tube voltage value input to said input means; and

output means which outputs said limit tube current control program extracted by said extraction means.

12. An X-ray tube control apparatus comprising:

input means to which a maximum tube voltage value of an X-ray tube is input;

storage means which stores a plurality of focus lens control programs for controlling a focus lens in such a way as to minimize a focal point when an electron beam hits a target of said X-ray tube with a maximum tube voltage applied to the target, according to the maximum tube voltage values;

extraction means which extracts said focus lens control program from said plurality of focus lens control programs stored in said storage means which corresponds to the maximum tube voltage value input to said input means; and

output means which outputs said focus lens control program extracted by said extraction means.

13. The X-ray tube control apparatus according to Claim 9, wherein when there is no maximum tube

voltage value on the warming-up programs which matches with the maximum tube voltage value input to said input means, the maximum tube voltage value input to said input means is associated with the warming-up programs stored in said storage means in such a way that the maximum tube voltage value on the warming-up program is greater than the maximum tube voltage value input to said input means and a difference between the maximum tube voltage value on the warming-up program and the maximum tube voltage value input to said input means becomes minimum.

14. An X-ray tube control method,

wherein a plurality of warming-up programs for respectively increasing a tube voltage and a tube current of an X-ray tube to a maximum tube voltage value and a maximum tube current value corresponding thereto according to a process corresponding to a downtime during which said X-ray tube has not operated when said X-ray tube starts operating are stored in storage means of an X-ray tube control apparatus beforehand according to the maximum tube voltage values, and comprising:

an input step at which the maximum tube voltage value of said X-ray tube is input to input means of said X-ray tube control apparatus;

an extraction step at which extraction means of

said X-ray tube control apparatus extracts one from said plurality of warming-up programs stored in said storage means which corresponds to the maximum tube voltage value input at said input step; and

5           an output step at which output means of said X-ray tube control apparatus outputs said warming-up program extracted by said extraction means.

15. An X-ray tube control method,

          wherein a plurality of limit tube voltage control  
10 programs for stopping application of a tube voltage with a limit tube voltage value corresponding to a maximum tube voltage value of an X-ray tube as a threshold are stored in storage means of an X-ray tube control apparatus beforehand according to the maximum  
15 tube voltage values, and comprising:

          an input step at which the maximum tube voltage value of said X-ray tube is input to input means of said X-ray tube control apparatus;

          an extraction step at which extraction means of  
20 said X-ray tube control apparatus extracts one from said plurality of limit tube voltage control programs stored in said storage means which corresponds to the maximum tube voltage value input at said input step; and

25           an output step at which output means of said X-ray tube control apparatus outputs said limit tube

voltage control program extracted by said extraction means.

16. An X-ray tube control method,

5 wherein a plurality of limit tube current control programs for stopping application of a tube voltage with a limit tube current value corresponding to a maximum tube voltage value of an X-ray tube as a threshold are stored in storage means of an X-ray tube control apparatus beforehand according to the maximum  
10 tube voltage values, and comprising:

an input step at which the maximum tube voltage value of said X-ray tube is input to input means of said X-ray tube control apparatus;

15 an extraction step at which extraction means of said X-ray tube control apparatus extracts one from said plurality of limit tube current control programs stored in said storage means which corresponds to the maximum tube voltage value input at said input step; and

20 an output step at which output means of said X-ray tube control apparatus outputs said limit tube current control program extracted by said extraction means.

17. An X-ray tube control method,

25 wherein a plurality of focus lens control programs for controlling a focus lens in such a way as

to minimize a focal point when an electron beam hits a target of an X-ray tube with a maximum tube voltage applied to the target are stored in storage means of an X-ray tube control apparatus beforehand according to the maximum tube voltage values, and comprising:

an input step at which the maximum tube voltage value of said X-ray tube is input to input means of said X-ray tube control apparatus;

an extraction step at which extraction means of said X-ray tube control apparatus extracts said focus lens control program from said plurality of focus lens control programs stored in said storage means which corresponds to the maximum tube voltage value input at said input step; and

an output step at which output means of said X-ray tube control apparatus outputs said focus lens control program extracted by said extraction means.

18. The X-ray tube control method according to Claim 14, wherein when there is no maximum tube voltage value on the warming-up programs which matches with the maximum tube voltage value input at said input step, the maximum tube voltage value input at said input step is associated with the warming-up programs stored in said storage means in such a way that the maximum tube voltage value on the warming-up program is greater than the maximum tube voltage value input at said input step

and a difference between the maximum tube voltage value on the warming-up program and the maximum tube voltage value input at said input step becomes minimum.